Colorimetric Analyses Using a Spectrophotometer[1]					
Analytes	**Medium**	**Approximate Detection Limits and Analytical Range[3] (mg/L)**	**Samples per Day**	**Interferences[2]**	**Performance Tips and Limitations**
Aluminum	Water	0.03 Range 0-0.8	The number of samples that can be analyzed per day is dependent on the number of steps in the test kit, and the length of time taken for optimum color development. Generally, the range will vary between 20 and 50.	Cr^{+6}, Cu, Fe, F Hexametaphosphate, Ortho Phosphate	Sample temperature must be between 20-25° C for accurate results.
Barium	Water	1.0 Range 0-100		Sr	A turbidimetric method which may require care to ensure suspension does not settle before reading.
Boron	Water	0.02 Range 0-1.5		Alkalinity, Biocides, Br, Cl, Fe, Nitrites	The Azomethine-H method has reaction chemistry that is very temperature dependent.
Bromine	Water	0.03 Range 0-4.5		Alkalinty, Acidity, Cl, I, O_3, Bromamines, oxidized forms of Mn and Cr	Use glass containers only for sampling and analysis. Initial sample should not have headspace.

Colorimetric Analyses Using a Spectrophotometer[1] (Continued)

Analytes	Medium	Approximate Detection Limits and Analytical Range[3] (mg/L)	Samples per Day	Interferences[2]	Performance Tips and Limitations
Cadmium	Water	0.001 Range 0-0.08		Cu, Bi, Hg, Ag	Adequate ventilation, preferably a fume hood, required. Method uses potassium cyanide and chloroform.
Chloride	Water	0.3 Range 0-20		pH above 2 will require adjustment	Mercuric Thiocyanate Method. Use pH paper rather than a pH electrode to determine the pH of samples for this analysis.
Chlorine, free	Water	0.01 Range 0-2.0		Alkalinty, Acidity, Br, I, O_3, Mono-chloramine, oxidized forms of Mn and Cr	Potassium Iodide (DPD) Method. Use glass containers only. This is an EPA accepted method for wastewater analysis.
Chlorine Dioxide	Water	0.03 Range 0-1.0		CrO_4>3.6, ClO>5.5, ClO_2>6.0, ClO_3>6.0, Fe^{+3}>5.0, O_3	Analyze samples immediately after collection. Temperature sensitive reaction.
Chromium, hexavalent	Water	0.01 Range 0-0.6		Fe>1.0, Hg, Vn>1.0	1,5-Diphenylcarbohydrazide Method, which is an EPA accepted method for wastewater analysis. Samples mut be analyzed within 24 hours.
Cobalt	Water	0.03 Range 0-2.0		Fe^{+2} interferes directly.	1-(2-Pyridylazo)-2-Naphthol (PAN) Method. There are a number of elements that interfere at levels generally not found in natural waters. Consult the kit for specific values.

Colorimetric Analyses Using a Spectrophotometer[1] (Continued)

Analytes	Medium	Approximate Detection Limits and Analytical Range[3] (mg/L)	Samples per Day	Interferences[2]	Performance Tips and Limitations
Copper	Water	0.02 Range 0-5.0		CN, Hardness	Bicinchoninate Method. EPA approved method for wastewater analysis.
Cyanide	Water	Range 0-0.2		Numerous interferences consult kit for list.	Pyridine-Pyrazalone Method. Extremely temperature sensitive. Analysis should be done in well ventilated area–preferably a hood.
Fluoride	Water	0.02 Range 0-2.0		Alkalinity, Al, Cl, Fe^{+3}, $(NaPO_4)_6$, PO_4, SO_4	Trisodium (4,5-Dihydroxy-3-[(p-sulfophenyl)-2,7-) naphthalenedisulfonic Acid (SPADNS) Method, field kit measures dissolved fluoride only.
Hydrazine	Water	Range 0-0.5		None given.	Sample temperature should be 21 ± 4° C
Iodine	Water	Range 0-7.0		Alkalinty, Acidity, Br, Cl, O_3, oxidized forms of Mn and Cr	Use glass containers only for sampling and analysis. Samples must be analyzed immediately.
Iron, total	Water	0.03 Range 0-1.80		Concentra-tions that may interfere (mg/L): Cd >4, Cr^{+3} >0.25, Cr^{+6}>1.2, Co >0.05, Cu>0.6, CN>2.8, Mn>50, Hg>0.4, Mo>4, Ni>1, Nitrite>0.8.	Rinse glassware with HCl to avoid erors due to iron deposits on the glass. Analysis is very pH sensitive.

Colorimetric Analyses Using a Spectrophotometer[1] (Continued)

Analytes	Medium	Approximate Detection Limits and Analytical Range[3] (mg/L)	Samples per Day	Interferences[2]	Performance Tips and Limitations
Lead	Water	0.003 Range 0-0.16		Bi, Hg, Sn, Cu, Ag	Dithizone Method, which requires well ventilated area (uses nitric acid, chloroform, sodium hydroxide, and potassium cyanide). Should not be performed in direct sunlight. The EPA accepted method for wastewater analysis requires an additional digestion step which is generally not practicable in the field.
Manganese	Water	0.03 Range 0-0.7		Pb>.5 mg/l	1-(2-Pyridylazo)-2-Naphthol (PAN) Method. There are a number of elements that interfere at levels generally not found in natural waters. Consult the kit for specific values
Molybdenum	Water	0.03 Range 0-3.0		Biocides	Ternary Complex Method. There are a number of elements and compounds that interfere at levels generally not found in natural waters. Consult the kit for specific values
Nickel	Water	0.02 Initial Range 0-1.8		Co, Cu, Fe	Heptoxime Method. EPA accepted method for wastewater analysis. However an additional digestion step is required, which may not be practicable in the field.
Nickel	Water	Kit is for 0-1.0 with a precision of ± 0.0037		Fe^{+2} interferes directly must not be present	1-(2-Pyridylazo)-2-Naphthol (PAN) Method. There are a number of elements that interfere at levels generally not found in natural waters. Consult the kit for specific values. Sample must be at room temperature for analysis.
Nitrogen (ammonia)	Water	Kit is for 0-0.5 with a precision of ± 0.015		Hydrazine, Glycine	Salicylate Method. There are a number of elements and compounds that interfere at levels generally not found in natural waters. Consult the kit for specific values

Colorimetric Analyses Using a Spectrophotometer[1] (Continued)

Analytes	Medium	Approximate Detection Limits and Analytical Range[3] (mg/L)	Samples per Day	Interferences[2]	Performance Tips and Limitations
Nitrogen (nitrate)	Water	Kit is for 0-0.40 with a precision of ± 0.01 Other kits available with higher ranges		NO_2, Ca, Cl	Cadmium Reduction Method. Care should be taken to prevent inhalation or ingestion when opening containers of powdered cadmium. This element is toxic.
Nitrogen (nitrite)	Water	0.001 Range 0-0.3		Strong oxidizers and reducers; Cu^{+2}, Fe^{+2}; Fe^{+3}, Hg, Ag, Bi, Sb, Pb, Au may cause precipitation.	Diazotization Method. EPA approved for reporting wastewater analysis. Preparation of standards may be diffficult.
Phosphorus, Reactive	Water	0.01 Range 0-2.5			PhosVer3 (Ascorbic Acid) Method. EPA accepted method for wastewater analysis reporting. There are a number of elements and compounds that interfere at levels generally not found in natural waters. Consult the kit for specific values
Silica	Water	Range 0-1.6		Fe, PO_4, Sulfides	Heteropoly Blue Method.
Silver	Water	Range 0-0.6		CN, S_2O_3	Colorimetric Method. A digestion step is required for samples containing organic matter, thiosulfate, or cyanide. There are a number of elements and compounds that interfere at levels generally not found in natural waters. Consult the kit for specific values
Sulfate	Water	7 Intial Range 0-70		Ca> 20,000, Cl> 40,000, Mg> 10,000, Si> 500	SulfaVer 4 Method. EPA accepted method for wastewater analysis reporting. Turbidimetric method that requires care to prevent the suspension settling out.

[1]The information presented in this Table is based on the values given by the manufacturers of Hach Test Kits.

[2] Interference from turbidity is common to all colorimetric analyses.

[3] The range refers to the initial expected concentration that the target analyte will be. Concentrations outside the specified range will result in inaccurate results. The ranges given do not take into account the dilutions that can be made to bring an analyte within the calibrated range of the analysis.